

# **Regenerative Pest and Disease Management**



**Regenerative Agriculture - Using ecological systems to manage pests and diseases**

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# Cultural Controls

## Pests and Diseases



**Setting up natural systems to prevent or reduce pests**

### **Soil Health**

- Soil health is the key principle to successful regenerative organic farming
- Most pest and diseases are opportunistic. They 'attack' plants that are stressed
- Correctly balanced soil ensures minimal disease and insect damage
- These soils are rich in beneficial organisms, nutrients and have a good structure

# Soil Health



Wheat grown on  
compost treated  
field does not have  
rust

Wheat grown  
with  
chemical  
fertilizers  
requires  
spraying with  
fungicide  
for rust





**Wheat infested with stripe rust and sprayed with fungicides – gave yield of 1.6 t/ha (1,600 lbs per acre)**





**Wheat grown on composted soil  
resists the rust – gave yields over 6.5 t/ha  
(6,500 lbs per acre)**





# Soil Health



**Insect damage controlled by improving soil nutrition and organic matter levels leading to plant health**

**Healthy plants have a greater ability to beat pests and diseases**





# Functional Biodiversity-Agroecology



- Refuges of flowering plants are known as insectaries
- Many beneficial insects have a range of host plants
- Some useful species such as parasitic wasps, hoverflies and lacewings have carnivorous larvae that eat pests however the adult stages live mostly on nectar and pollen from flowers

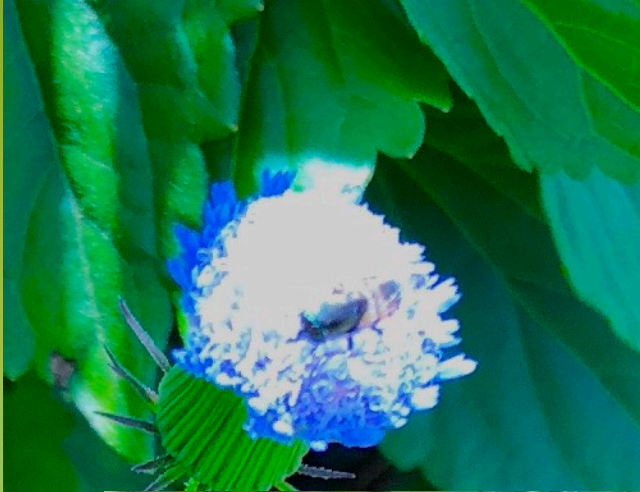
**Nectar and pollen are essential to the adult stage of many beneficial predators**



**Research has shown increasing the host plants in farms breed thousands of beneficial organisms that control pests**



# Beneficials





# INSECTARIES



**Flowers provide nectar, pollen, mating sites and refuges for beneficial insects**





## **Different Insectary Models**

**Perimeter plantings in the USA  
Host beneficials, act as barrier  
for pests and as windbreaks**

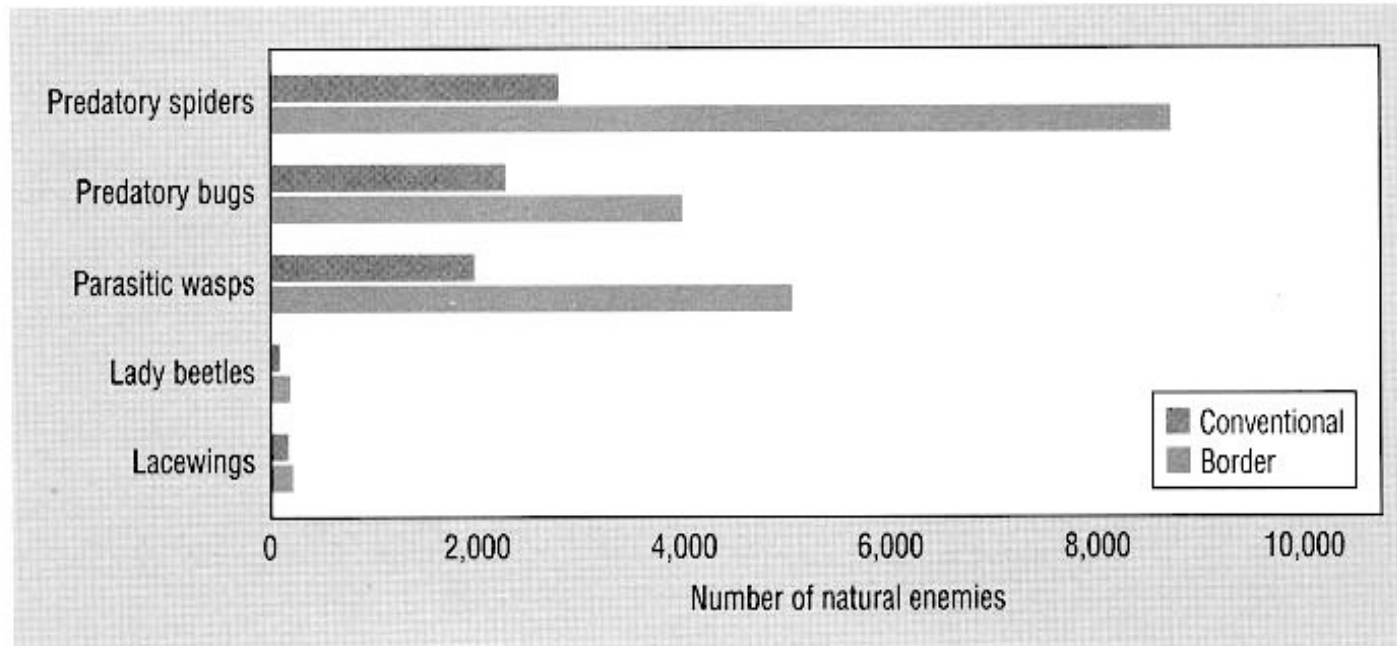




# Eco-Functional Intensification

## Strip Mowing

Leaving rows of insectary plants increases the number of beneficial insect species



■ FIGURE 6-2. Comparison of the relative abundance of naturally enemies in a border versus a conventional cut alfalfa field over a 4-month period from May through September. Data from Summers 1976.



# Eco-Functional Intensification



*Insectaries*

**Refuges  
Created by  
Strip  
Mowing**





# Eco-intensification, Agroecology



## *Insectaries*

**Borders of flowers, trees and shrubs create refuges for beneficial insects, birds, lizards, frogs etc.**

**Small birds eat an enormous amount of insect pests and need shrubs**

**Provide forage for livestock**

**Provide biomass for compost**



**Marginal areas planted with a high diversity of eco functional species, Bhutan**



# Field Borders: Biodiverse vegetation as Insectaries



**Provide habitat for birds, frogs lizards and beneficial insects**

**Act as a barrier for pests and diseases**

**Windbreak to shelter cash crop**

**Stock feed**

**Legumes provide nitrogen**



**Highly diverse field border hedges on organic farms in Kenya**

**Sustainably harvested biomass can be used for compost and bio gas generation**



# Eco-intensification Agroecology



## *Insectaries*

Borders of  
sunflowers in  
Myanmar  
create  
refuges for  
beneficial  
insects

Attracts and  
traps pests  
before they  
enter the  
field





**Does not compete  
for sunlight**

**Fixes nitrogen** and  
soil carbon – roots  
add nutrients  
instead of  
competing  
**Green Manure**

**Flowers** attract  
beneficial  
Insects

**Conserves water**  
and soil – living  
mulch

**Maximize Solar Capture  
to make  
The Molecules of Life**



**High Species Biodiversity,  
Australia**

Legume vines in fruit trees. Example of  
good practice and not a neglected orchard



The background of the slide is a photograph of a natural landscape. In the foreground, there is a dense field of green plants with small yellow flowers. In the background, several trees with green foliage are visible, creating a sense of a healthy, thriving ecosystem.

# **Maximize Solar Capture to make The Molecules of Life**

**High Species Biodiversity**

**Does not compete for sunlight**

**Fixes nitrogen and soil carbon**

**Green Manure**

**Flowers attract beneficial Insects**

**Conserves water and soil – living  
mulch**





**Maximize Solar Capture  
to make**

**The Molecules of Life**

**High Species Biodiversity**

**Does not compete for sunlight**

**Fixes nitrogen and soil carbon**

**Green Manure**

**Flowers attract beneficial Insects**

**Conserves water and soil – living  
mulch**



# Spray Management



**Spraying pesticides and fungicides should be regarded as the tools of last resort**

## **Non Toxic Sprays**

- Vegetable oils
- Flour and water
- Mild soap
- Clay and water

## **Natural Minerals**

- Sulfur
- Copper sulfate
- Baking soda
- Borax
- Diatomaceous earth



# Spray Management



**Spraying pesticides and fungicides should be regarded as the tools of last resort**

## **Botanicals**

- Essential oils
- Natural Pyrethrums

## **Biological Pesticides**

- *Bacillus thuringiensis* var *kurstaki* for caterpillars
- *Bacillus thuringiensis* var *tenebrionis* for beetles
- *Metarhizium* species or grasshoppers, beetles, white flies and a range of insects
- *Trichoderma* species for controlling diseases
- *Cliocladium virens* for controlling diseases
- *Bacillus subtilis* for controlling diseases



# Spray Management



**Never use full cover spray as this will kill the beneficials**

**Locking farmers into endless losing spray battles**

## **Hot Spot Spray**

- Monitor for areas with highest concentration of pests
- Only spray these areas
- The beneficial species in the other areas will control the remaining pests
- This ensures a healthy population of beneficial species



Minimal solar  
capture

Not Eco-function  
intensification



No Fix of nitrogen  
and soil carbon

No Green Manure

No Flowers to  
attract beneficial  
Insects

Does not conserve  
water

Soil subject to wind  
and water  
erosion



This is an example of worst practice in weed  
and soil management



# Thank You

